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Reduced switching delay in wavelength division multiplexed two-dimensional multiple-plane optical interconnections using multiple-wavelength VCSEL arrays

Leight, J.E., Wilner, A.E.

Dept. of Electr. Eng. Syst., Univ. of Southern California, Los Angeles, CA, USA;

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Publication Date: June 1996

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INSPEC Accession Number: 5319069

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Abstract

We calculate the expected number of internodal hops for a network established with a wavelength division multiplexed (WDM) two-dimensional (2-D) multiple-plane optical interconnection. This WDM optical interconnection incorporates WDM pixels consisting of multiple-wavelength vertical-cavity surface-emitting laser (VCSEL) arrays and wavelength-selective detectors. The WDM interconnection can support simultaneous and reconfigurable communication among a network of nodes. Using the expected number of hops as a measure of intermodal switching delay, we show that the integration of WDM into the interconnection results in a significantly reduced delay as compared to single-wavelength systems. Substantial delay reduction results even when the number of wavelengths is small relative to the number of 2-D planes. We analyze the bus, dual-bus, and ring architectures since they define the means of communication between pixels. For each architecture, we analyze three configurations which provide each node access to (i) an entire plane of pixels, (ii) a row (or column) of pixels, or (iii) an individual pixel. When each network node has access to an entire plane of pixels, the proposed WDM interconnection incurs substantially shorter delay than single-wavelength optical interconnections. By allowing a node to access an entire row or column of pixels, the interconnection benefits from the incorporation of spatial division multiplexing (SDM) and the number of nodes connected can grow substantially, with negligible added delay. Finally, when a node can access only a single pixel, a large number of independent processors can be interconnected exhibiting far less switching delay than other electronic or optical interconnections of comparable size

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vertical-cavity surface-emitting laser arrays, optical interconnections, reduced switching delay, ring architectures, single-wavelength optical interconnections, single-wavelength systems, spatial division multiplexing, wavelength division multiplexed two-dimensional multiple-plane optical interconnections, wavelength-selective detectors

Author Keywords
Not Available

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